climatic investigation. More stations must be sampled and incorporated in the present study, and earlier time periods should be analyzed. However, there are fewer chronologies during these early periods and errors may be greater, for fewer specimens are available and these specimens are likely to be relatively short archaeological pieces. Because of these difficulties, mapping of the climate prior to the 16th century was not attempted. However, plots and comparisons of the early data show climatic variations comparable to those mapped in figures 2–10.

It is hoped that this kind of investigation will provide a basis for relating the short periods of recorded weather to climatic patterns of the past as well as provide clues to the nature and causes of climatic change. It is reasonable to infer that this type of analysis may be applied to other arid or cold areas of the world. A series of such analyses on a global scale would provide highly valuable regional information on long-term fluctuations in atmospheric circulation and on possible factors influencing the heat balance and water economy of marginal lands.

## **ACKNOWLEDGMENTS**

This work was supported by the U.S. Weather Bureau, contract Cwv-10798. The analyses of the tree-growth relationships were also sponsored by the National Geographic Society and the U.S. Department of Interior, National Park Service, through the Wetherill Mesa Archaeological Project. The author acknowledges the able assistance of David G. Smith and Richard L. Holmes. He is also indebted to past and present staff at the Laboratory of Tree-Ring Research for the development of the regional tree-ring chronologies, and to the Numerical Analysis Laboratory, The University of Arizona, for free computing time and services. He wishes to express his appreciation for the help of James A. Erdman, Maurice E. Cooley, and Julie McMahan, who contributed to various phases of the project.

## REFERENCES

 H. S. Colton, "Precipitation about the San Francisco Peaks, Arizona," Museum of Northern Arizona Technical Series, No. 2, 1958, 18 pp.

- 2. A. E. Douglass, "Photographic Tree-Ring Chronologies and the Flagstaff Sequence," *Tree-Ring Bulletin*, vol. 14, No. 2, 1947, pp. 10-16.
- 3. H. C. Fritts, "An Approach to Dendroclimatology: Screening by Means of Multiple Regression Techniques," *Journal of Geophysical Research*, vol. 67, No. 4, Apr., 1962, pp. 1413-1420.
- H. C. Fritts, "Computer Programs for Tree-Ring Research," Tree-Ring Bulletin, vol. 25, Nos. 3-4, 1963, pp. 2-7.
- H. C. Fritts, "The Continuation of 'A Study of the Physiological Relationships Underlying Correlations of Tree-Ring Width and Climate," Report and Proposal to the National Science Foundation, GB-1025, Jan. 1965, 22 pp.
- 6. H. C. Fritts, D. G. Smith, and M. A. Stokes, "The Biological Model for Paleoclimatic Interpretation of Mesa Verde Tree-Ring Series," in "Contributions of the Wetherill Mesa Archaeological Project," Assembled by Douglas Osborne, Memoir of the Society for American Archaeology, vol. 2, Part 2, Oct. 1965 (in press).
- H. C. Fritts, D. G. Smith, J. W. Cardis, and C. A. Budelsky, "Tree-Ring Characteristics Along a Vegetational Gradient in Northern Arizona," *Ecology*, vol. 46, 1965 (in press).
- 8. H. C. Fritts, D. G. Smith, C. A. Budelsky, and J. W. Cardis, "The Variability of Ring Characteristics Within Trees as Shown by a Reanalysis of Four Ponderosa Pine," *Tree-Ring Bulletin*, vol. 27, 1965, (in press).
- E. Schulman, "An 800-Year Douglas-Fir at Mesa Verde," Tree-Ring Bulletin, vol. 14, No. 1, 1947, pp. 2-8.
- E. Schulman, "Dendrochronology at Navajo National Monument," Tree-Ring Bulletin, vol. 14, No. 3, 1948, pp. 18-24.
- E. Schulman, "Dendrochronology in Northeastern Utah," *Tree-Ring Bulletin*, vol. 15, Nos. 1-2, 1948, pp. 2-14.
- E. Schulman, Dendroclimatic Changes in Semiarid America, University of Arizona Press, Tucson, 1956, 142 pp.
- S. D. Scott, Tree-Ring Dating in Mexico, Ph. D. dissertation, University of Arizona, Tucson, 1963, (pp. 137-138).
- 14. T. L. Smiley, S. A. Stubbs, and B. Bannister, "A Foundation for the Dating of Some Late Archaeological Sites in the Rio Grande Area, New Mexico," *University of Arizona Bulletin*, vol. 24, No. 3, 1953, pp. 54-55.
- 15. M. A. Stokes, "Dendroclimatology of the Sacramento Mountains, New Mexico," U.S. Air Force Report, Contract AF19(604)-7474, 1961, 7 pp.

[Received February 5, 1965; revised May 17, 1765]

## New Weather Bureau Publication

Research Progress and Plans of the U.S. Weather Bureau, Fiscal Year 1964, Washington, D.C., Jan. 1965, 150 pp. For Sale by Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. Price \$1.00.

Annual report of progress made on the research program of the Weather Bureau in the fiscal year ending July 1964, and plans for continued research in fiscal year 1965.